The Resource
for Environmental Education in Missouri
February 2001 • Vol. 4 • No. 3

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An entire issue devoted to
Agriculture and Private Lands

Cultivating a Partnership
Agriculture & Natural Resources

By: Bob Miller
Agriculture Liaison Missouri Department of Conservation

Agriculture to some is a way of life, to others a profession, to all of us our food supply. Agriculture also provides fish, forest, and wildlife resources many Missourians have come to expect and enjoy. Most people relate a picturesque vision of agriculture as vast crop fields and livestock grazing on hillsides next to flowing streams. A closer look reveals agriculture providing food and homes for wildlife as well as management of the watershed leading to streams. All Missourians are in some form connected to agriculture as our economy and life-style are dependent on the health of our natural resources.

Good land ethic, known as stewardship, is critical to the management of natural resources and the sustainability of agriculture production. The responsibility of this stewardship falls primarily on private landowners, as approximately 93% of Missouri's landscape is in private ownership. Farm economics have been less than good in recent years often causing landowners to concentrate on production and sometimes overlook the value of natural resources. The American public clearly supports agriculture and natural resources through the U.S. Department of Agriculture (USDA). USDA farm programs offer landowners economic support and assist with implementation of conservation practice. Best management practices, known as BMPs, are designed to boost farm income and protect natural resources. Agriculture decisions not only determine farm production and income, but also the health of our environment including soil, water, air, and wildlife resources.

With the future of our natural resources dependent upon the voluntary cooperation and land stewardship of private landowners, our responsibility as educators, agencies, and resource partners is great. Providing sound information and technical assistance to these private landowners is critical to long-term sustainability of our natural resources. To help accomplish this the Missouri Conservation Department recently initiated an aggressive private landowner assistance program. Partnership development with state and federal agencies, commodity groups, educators, and agribusiness interests is the main delivery method for landowner information. This landowner assistance program is a long-term commitment to the citizens of Missouri to enhance natural resources of the state and strengthen the relation with Missouri agriculture. Our hope is that you, as educators, feel compelled to be a resource partner in promoting the sustainability of our state's agriculture and natural resources.

PLS: A Plus for Private Lands

By: James Cryer
Private Land Conservationist
Missouri Department of Conservation

Missouri Department of Conservation's Private Land Services (PLS) is dedicated to helping landowners enhance their property in terms of income, recreational opportunities, aesthetics and conservation of resources for future generations. In addition to working with private land owners this division works with schools through their agriculture education and science programs. Here's a snapshot of the services and programs Private Land Service offers.

Schools - Technical assistance for establishing outdoor classrooms and wildlife habitat; outreach programs on agriculture and natural resources.

Agriculture - Improving production and protecting resources through innovative practices including native grass plantings, windbreaks, erosion control practices, improved grazing systems, alternative watering methods, alternative and sustainable crops, and agro-forestry.

Natural Communities - Restoring native communities like prairies, wetlands and forests; promoting the value of native plants.

Streams - Implementing erosion and stabilization controls; improving riparian corridors and establishing buffer strips for habitat and water quality.

Forests - Woodland management practices for timber stand improvement and habitat enhancement; assistance with timber sales; recommendations for alternative and sustainable crops.

Ponds - Construction of new ponds; restoration of existing ponds; assistance with vegetation control and shoreline protection; fish farming; predator control.

Wildlife - Habitat improvement including food plats and cover plantings; wildlife damage control.

Through these and other programs MDC's Private Land Services is working with landowners and conservation partners to assure a future of sustainable agriculture, quality natural resources, and a healthy environment.

For more information contact your local Missouri Department of Conservation office or Veronica Feilner at (573) 751-4115 x 3285 or <feilnv@mail.conservation.state.mo.us>

Did you know?

Missouri produced and sold approximately $4.57 billion worth of crops, livestock, poultry and aquaculture in 2000. Livestock and poultry accounted for 59% while crops made up 41%.

Show Me Agriculture

By: Marla Young
Missouri Department of Agriculture

In this day and age of cell phones, air and space travel, and instant email communication to nearly every corner of the world, it's easy to lose sight of our connections to agriculture. Very few of us live on farms any more or even have parents or grandparents who do. Educators face an enormous challenge in helping students understand this important connection. There are numerous examples that demonstrate how agriculture impacts daily life.

The most obvious is our abundant food supply. Whether you shop at the super center or the local farmers market, it is evident we have access to high quality, affordable foods. Take special note of the foods you consume – it's likely many have been produced or processed in Missouri. Our state is home to 109,000 farms, second in number to Texas. These 109,000 farms produce everything from corn, soybeans, beef and dairy cattle, hogs, broilers, turkeys and eggs to apples, peaches, green beans, cucumbers and squash.

Although locally produced goods are increasingly easy to find, international trade is an economic and political necessity in this global age. The United States has products that other countries need, just as we expect access to items not produced in the U.S. Missouri products are well known and successful in international trade circles. Approximately one-fourth of Missouri agriculture production is exported annually. Exports include bulk commodities such as corn, soybeans, rice and wheat, as well as beef, popcorn, food-grade soybeans and pet food. We also export consumer items including nursery stock, high grade oak and walnut lumber, and food processing equipment.

Many non-food items also come to us courtesy of the state's vital agriculture industry. Cotton and wool are two examples. The southeastern part of the state is annually planted to 400,000 acres of cotton. Last year 63,000 Missouri sheep were shorn of their wool to provide sweaters, coat linings, and lanolin for chapped hands. Missouri is home to two farmer-owned ethanol plants, with others in the planning stage. Each plant processes about six million bushels of corn a year into 15 million gallons of ethanol. Missouri producers reap the benefits of adding value to an agricultural commodity, while decreasing dependence on foreign oil.

Agriculture doesn't simply include the two percent of our population involved in farming, but encompasses more than 250 career tracks, including sales, engineering, entomology, banking, appraisal services, trucking, accounting, food brokerage, education, radio and television broadcasting, rural sociology, dietetics, food sanitation, wildlife management and veterinary medicine. In the U.S., approximately 22 million people are employed in the field of agriculture which represents 17% of total employment.

Despite our fast-paced world and the fact that most people no longer come from a farming background, it is hoped that a true appreciation for farming can be realized. From the sheets we sleep on to the birthday cakes and ice cream we enjoy, agriculture is a life-giving force for all.

Fish Farming

By: Syd Hime
Environmental Education Coordinator
Missouri Department of Conservation

Aquaculture - the farming of fish, shrimp, shellfish, seaweed and aquatic plants has been a global practice for nearly 4,000 years. Traditionally the propagation and harvest of aquatic animals and plants in Missouri was viewed as a natural resource activity. Today, commercial aquaculture is recognized as an agriculture practice. Approximately 50 fish farms across the state produce 35 different species of aquatic animals and plants. Most fish are sold live for restocking in private lakes and ponds. However, many fish farms market foodfish such as channel catfish and rainbow trout directly to customers and local restaurants. Largemouth bass, sunfish, hybrid striped bass, tilipia, and paddlefish also contribute to the diverse foodfish industry in Missouri. With increasing consumer demand for healthy and nutritious foods, fish has become a preferred alternative. This demand is reflected in the fact that aquaculture is the fastest growing segment of U.S. agriculture.

On the global front world aquaculture production has increased more than 300% since 1984. Asia dominates world aquaculture, producing almost 90% of all farmed fish, shrimp, and shellfish. China is the leading producer, contributing nearly 70% of the world production, or about 22 million metric tons annually. Their production is dominated by carp raised primarily as a supplementary activity to regular farm crops and marketed for local consumption.

Unfortunately there are some detrimental environmental impacts associated with aquaculture. Shrimp farming has taken an especially heavy toll on coastal habitats, with mangrove swamps in Africa and Southeast Asia being cleared at an alarming rate to make room for shrimp ponds. Intensive aquaculture can also lead to water shortages and pollution. When water is flushed from fish ponds into surrounding coastal or river waters in exchange for fresh supplies, its heavy concentrations of fish feces, uneaten food, and other organic debris can lead to oxygen depletion and contribute to harmful algae blooms. Problems can also occur when captive raised fish such as salmon escape and intermingle with the wild population, which could contaminate the native gene pool.

As with other agriculture operations research and new technology are making great strides in reducing these and other detrimental environmental impacts. Both voluntary and regulated programs are helping fish farmers become more environmentally friendly while simultaneously moving toward low-impact, high productivity fish farming.

Agroforestry

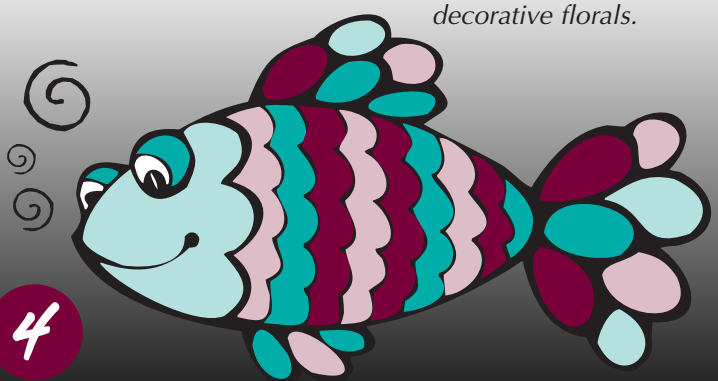
Growing Benefits

By: Paulette Strader
Missouri Department of Conservation

The practice of Agroforestry may be relatively new to Missouri, but it hasn't taken long to realize the benefits are worthy. The deliberate planting of trees in the midst of crops or livestock can provide financial security to the farmer as well as increased environmental benefits.

It's a fact there is concern about the effect of modern agriculture on the environment. There is also an understanding the farmer concentrates on high crop yields to enhance income. Agroforestry favors both concerns. Detailed below are five practices demonstrating the benefits:

Alley Cropping - Growing trees in widely spaced rows with a companion crop in the alleyway.
Example- Black walnut or pecan trees intercropped with wheat or hay. While trees mature to nut production age, farmers harvest annual wheat or hay crops to offset establishment costs.
Silvopasture - Combining trees with domestic forages and grazing livestock.
Example- Cattle grazing on managed forage in a native pecan stand managed for nut production.
Example- Incorporating Christmas tree production with sheep. The sheep are used for weed control and supplemental fertilization.
Riparian Forest Buffer - Strips, including combinations of perennial vegetation, planted between cultivated fields and waterways to reduce runoff and non-point source pollution.
Example- Cuttings from willows or other fast-growing riparian tree species are stuck in the streambank and root. As they grow, herbaceous and perennial vegetation fills in the understory, protects the streambanks from soil loss due to water erosion and filters out undesirable inputs, such as chemicals.
Windbreaks - Growing trees in rows several hundred feet apart to protect crops and livestock from wind or snow.
Forest farming - Growing specialty crops in managed natural forest stands.
Example- Additional income from the forest include growing medicinal plants such as ginseng, edibles like mushrooms or decorative florals.



Fire & Satellites

Tools of the Trade

By: Gerry Snapp
4-H Youth Development Specialist
University of Missouri

Agriculture and the environment are intimately connected. The environment is the world around us. In Missouri much of our environment is agriculture. The majority of land in the state (93%) is privately owned and close to 30 million acres is in farms. Approximately 30% is in grasses, suitable for haying or grazing, and 30% in actual crop production. Another 35% is forested, some of which may be grazed or utilized for forest products. The state's 56,000 miles of streams and rivers run through our agricultural lands. Farming practices utilized on these lands, including the following examples, provide true benefits for the environment.

Prescribed Burning
Controlled or prescribed burning provides direct benefit for agriculture and wildlife. For the farmer, prescribed burning controls undesirable woody vegetation, helps control plant disease, improves quantity and quality of forage production, reduces incidents of hazardous wildfires, improves livestock grazing distribution and increases livestock gains. Burning is also very cost effective for farmers when compared to chemical or mechanical methods of brush control.

Prescribed burning can be a wildlife habitat improvement tool for many of the same reasons. Burning increases native forbs, including legumes, which provide cover, seeds and sources of insects for ground nesting and foraging wildlife. The removal of dead litter from the ground exposes seeds, stimulating seedlings to develop and allowing wildlife to easily move under a protective canopy.

Precision Agriculture
Precision agriculture is an information-based, management-intensive approach to farming that uses the technologies of Global Positioning System (GPS) and Geographic Information System (GIS). Farmers use GPS and GIS to map and then manage their fields in units as small as 2.5 acres as opposed to managing whole fields of 160 acres or more as a single unit.

Crop yields and the potential for yields are variable across large fields for a variety of reasons, including moisture, soil properties, and environmental characteristics. GPS and GIS allow farmers to manage the small units based on these variables.

Benefits from precision agriculture include higher yields and lower production costs for the farmer and enhanced protection of the environment. The variable-rate technology can limit the amount of fertilizers and pesticides used. Farmers have the ability to determine minimal levels of inputs to achieve maximum production. There is now a solution to applying "more than needed" in some parts of the field just to make sure there is enough elsewhere. Chemical run off from fields into streams and waterways is lowered, which is good for everybody.

Did you know?

In the U.S. Missouri

- raises 9% of the turkeys
- grows 6% of the soybeans
- performs 6% of the cattle operations
- grows 5% of the grain sorghum
- performs 5% of the hog operations

The Leopold Education Project Lessons in a Land Ethic

"The objective is to teach the student to see the land, to understand what he sees, and enjoy what he understands."
Aldo Leopold

Based on the classic writings of renowned conservationist Aldo Leopold, the Leopold Education Project (LEP) is a conservation ethics curriculum for grades 6-12. Using phenology as an integrating context for language arts, reading, science and social studies, LEP's lessons correspond to essay's in Leopold's *A Sand County Almanac.* The essays help students "read" the land through outdoor explorations such as tracking animals in the snow, correlating local history with growth of an oak tree, observing migrations, star gazing and many more. Activities can be done easily in an outdoor classroom or on school grounds.

LEP materials are available by attending a six-hour workshop that allows educators to experience activities from the guide and learn teaching strategies. For more information about a workshop in your area contact the state LEP coordinator: Janice Greene, Department of Biology, SMSU, 901 S. National, Springfield, MO 65804-009 Phone 417-836-5306 Fax 417-836-4204 email <janicegreen@smsu.edu>

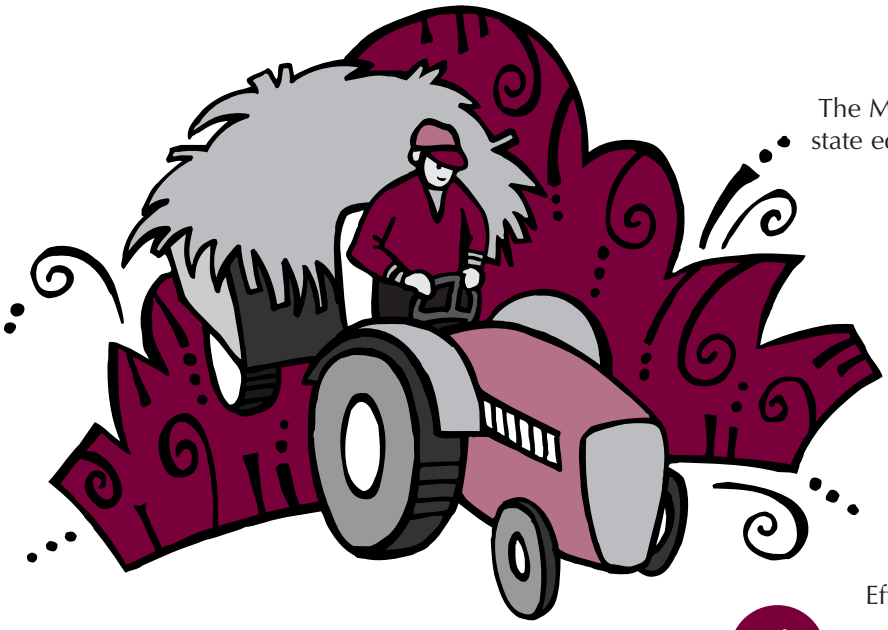
Adding an A to the 3-Rs

Students across the state germinate seeds and perform scientific inquiry that is actually agricultural in nature. However, many fall short of making the connection. The ***Agriculture in the Classroom*** program is a catalyst for joining education and agriculture. The intent is to supplement on-going curriculum, not add to the instructor's already overloaded agenda. This national program is sponsored locally by the Missouri Farm Bureau.

Two-day, one hour graduate courses provide creative ideas for utilizing Ag in the Classroom. This training provides hands-on activities, free resource materials and endless ideas for integrating ag information into language, math, science, conservation, social studies, economics and the arts. Several courses are scheduled throughout the state in connection with various universities.

For further information contact Diane S. Olson, Director of Promotion and Education Programs, Missouri Farm Bureau Federation, PO Box 658, Jefferson City, MO 65102 or call 573-893-1414 or fax 573-893-1560 or email **dolson@mofb.com**.

The Voice of Missouri Agriculture



The Missouri Farm Bureau provides a number of services to state educators in addition to Ag in the Classroom described above.

. Needing money to carry an agriculture unit to new heights? Over $7500 (in $200 increments) is available annually in the form of mini-grants.

. Going a step further, County Farm Bureaus across the state assist with resource materials including videos, curriculum materials and literature books with accurate portrayals of agriculture. In addition, resource people are available.

Efforts in Missouri are multifaceted. Visit the website at <www.mofb.org.> for a full description of programs.

Project Resource Guide: *Agriculture & Private Lands*

Looking for ways to connect agriculture and private lands to your curriculum? These activities from Projects WILD, Learning Tree, and WET provide hands-on, integrated, easy to use lessons that will help students discover their own connection to agriculture.

PROJECT WILD

Riparian Zone - Page 206 (Page345, 2001 edition) - Identify and describe factors frequently involved in land use planning and evaluate possible consequences when land use planning does not take place. (Grades 7-12)

Deadly Links - Page 270 - Explore ways in which pesticides enter food chains and describe possible consequences of the results. (Grades 4-9)

What Did Your Lunch Cost Wildlife? - Page 306 (Page 68, 2001 edition) - Trace foods from their source to the consumer, identify the impact those foods and their processing have on wildlife and the environment and recommend food habits that could benefit the environment. (Grades 4-12)

Water We Eating? - Page 120 (Page 83, 2001 edition) - Identify foods derived from aquatic sources and their geographic origins. Discover the importance of aquatic environments as food sources. (Grades K-12)

Dragonfly Pond - Aquatic Page 154 (Page 184, 2001 edition) - Evaluate the effects of different kinds of land use on wetland habitats and discuss lifestyle changes to minimize damaging effects on wetlands. (Grades 4-12)

For more information on Project WILD and Learning Tree workshops and materials contact: Bruce Palmer, State Coordinator, Missouri Dept. of Conservation, PO Box 180, Jefferson City, MO 65102-0180, (573) 751-4115 extension 3113, <palmeb@mail.conservation.state.mo.us>.

PROJECT Learning Tree

Environmental Exchange Box - Page 61 - Prepare an environmental exchange box while learning about your local region. Then supplement this knowledge by trading environmental exchange boxes with another region. (Grades K-8)

How Plants Grow - Page 135 - Explore what happens when a plant's basic needs are not met. (Grades 4-8)

Planning the Ideal Community - Page 191 - Identify elements that compose a human community and plan an ideal community that meets all the needs of its members. (Grades 6-8)

Soil Stories - Page 252 - Examine differences in soil types and what they mean. (Grades 5-8)

In the Good Old Days - Page 349 - Study the writings of men and women who have shaped the way people think about the environment over the course of several generations. (Grades 4-8)

PROJECT WET

Water Works - Page 274 -Create a "water web" to illustrate the interdependence among water users and producers.

AfterMath - Page 289 - Investigate how people are affected by floods and other weather events. (Middle School)

Dust Bowls and Failed Levees - Page 303 - Through literature study, research, and writing, gain a greater understanding of the effects of drought, flood and other water-related events on people. (High School)

For more information on Project WET workshops and materials contact; Joe Pitts, State Coordinator, Missouri Dept of Natural Resources, Technical Assistance Program, PO Box 176, Jefferson City, MO 65202, (800) 361-4827, <nrpittj@mail.dnr.state.mo.us>

The Library

Conservation and Environmental Education Resources

web resources

Agriculture in the Classroom
www.agclassroom.org/
Teacher and kid friendly website provides educators and students with information, lesson plans, activities and state contacts to increase agriculture literacy.

Finding Solutions to Hunger: Kids Can Make a Difference
www.kidscanmakeadifference.org
Five-week curriculum contains a rich, diverse and effective collection of activities that provide kids with a multidimensional understanding of national and global hunger.

GrowLab: Activities for Growing Minds
www.kidsgardening.com
Wonderful curricula for classroom gardens.

Fields of Genes: Making Sense of Biotechnology in Agriculture
www.fourhcouncil.edu/YCC/WENVNEW.HTM
An innovative curriculum designed to boost students' enthusiasm and interest in the burgeoning field of biotechnology. Designed to provide elementary and high school students with a basic understanding of the biotech field today as well as its future direction. Information plus age- appropriate activities.

Little Farmers Place
www.littlefarmersplace.com
A positive image of modern agriculture in simple terms and concepts for younger students. Designed for preschool and early elementary school age children.

Missouri Department of Agriculture
www.mda.state.mo.us
Official state website with a variety of information. A special educators section includes numerous activities.

Missouri Precision Agriculture Center
www.fse.missouri.edu/mpac
This site details the Missouri Precision Agriculture Center, an organization dedicated to coordinating and enhancing the University of Missouri's research, teaching and outreach efforts in site-specific crop management.

Earthtrends
http://earthtrends.wri.org/
An environmental information portal offering searchable databases, data tables, country profiles, maps and feature articles in topical sections including agriculture and food.

Agview
www.agview.com
A comprehensive search and index tool to help navigate the internet for data, information and resources related to farming and agriculture.

Natural Resources Conservation Service
www.nhq.nrcs.usda.gov
This organization promotes harmony between people and the land. Their website offers specific links to a number of conservation/agriculture lesson plans. Click on NRCS Home Page, followed by Teachers & Students.

PUBLICATIONS

The following publications are available from Acorn Naturalists, PO Box 2423, Tustin, CA 92781-2423 or (800) 422-886, <http://acornnaturalists.com>

A Handful of Dirt
Bial. New children's book for ages 7-12 on how soil is transformed into clothes, food, homes and more. Amazing photographs. #B-9151 ($16.95)

The Worm Café, Mid-Scale Vermicomposting of Lunchroom Waste
Payne. The story of how one school developed a system to compost lunchroom waste with worms and saved $6000 a year in waste disposal fees. Step-by-step instructions included. #INV-7247 ($29.95)

The Edible Schoolyard
Barlow. Exemplary middle school program that teaches from the garden, the kitchen and table comes empathy - for one another and for the natural world. #EE-9148 ($11.95)

PLEASE NOTE:
Copies of **The Resource** can be downloaded from the Department of Conservation website. Log on to <www.conservation.state.mo.us> and reference the education link.

Did you know?

Comparing Missouri production to other states, it ranks

- 6th in soybean & rice
- 9th in watermelon & corn
- 10th in cotton & broilers
- 12th in winter wheat
- 17th in milk.

EE Calendar

Check It Out

<www.conservation.state.mo.us/teacher/workshops> has up-to-date information on the Department of Conservation's teacher workshops. There's something for everyone!

February 6

Maple Sugaring
Rockwoods Reservation, Glencoe
4:00 - 6:00 pm
Learn how to identify and select trees, obtain equipment, tap trees, and turn maple sugaring into an educational program. For teachers and youth leaders.
Contact David Burns, MDC, (636) 458-2236

February 9

Outdoor Classrooms: Show-Me How, Show-Me Why
SMSU, Springfield
8:00 am - 4:00 pm
Fee: $25 (refundable)
Develop your own outdoor classroom. Topics include grants, getting started, stations and habitats, layout and design, and pitfalls.
Contact: Regina Knauer, MDC, (417) 895-6880, Melanie Carden-Jessen, MDC (417) 256-7161, Jeff Cantrell, MDC, (417) 451-4158.

February 16

Outdoor Classrooms: Show-Me How, Show-Me Why
Walter Woods, Joplin
8:00 am - 4:00 pm
See description and contacts above.

February 21

Project Learning Tree Workshop
12:00 - 6:00 p.m.
Osage Beach (Interface A)
Contact: Bruce Palmer, MDC, (573) 751-4115 x 3113 Fee: $15.00

February 23

Project WILD for Teachers
Hannibal
9:00 am - 4:00 pm
Fee: $20
Contact Karen Armstrong, MDC, (660) 785-2420

February. 26

Project WILD for Non-formal Educators
County Extension Office, Kirksville
9:00 am - 4:00 pm
Fee: $20
Contact Karen Armstrong, MDC, (660) 785-2420

March 1-2

Wetlands and Waterfowl
Fountain Grove CA
1st - 4:30 - 7:30 pm
2nd - 7:00 am - 12:00
Discover the lure of a wetland, its unique features and the birds that are drawn to it. This workshop will help you better understand wetlands and their importance in respect to the spring migration. Binoculars will be provided! Contact: Greg Collier, MDC, (660) 646-6122

March 9

Project WET
SMSU, Springfield
9:00 am - 4:00 pm
This workshop is a supplementary environmental education program for K-12 educators and youth leaders. Participants will receive a cross-curricular activity guide containing 96 activities plus their associated correlations to the Show-Me Standards.
Contact: Jean Mayer, MDC, (417) 895-6880, x 1036

March 15-16

The Nature of Math & Science in the Outdoor Classroom
SMSU, Springfield
15th - 5:00 - 10:00 pm
16th - 7:00 am - 6:00 pm
Designed for pre-service or in-service educators interested in utilizing the outdoor classroom to teach Math and Science content.
Contact Regina Knauer, MDC, (417) 895-6880, Melanie Carden- Jessen, MDC (417) 256-7161, Jeff Cantrell, MDC, (417) 451-4158.
(1 hour undergraduate/graduate credit option)

March 22-23

The Art & Language of Nature in the Outdoor Classroom
SMSU, Springfield
22nd - 5:00 - 10:00 pm
23rd - 7:00 am - 6:00 pm
Designed for pre-service or in-service educators interested in utilizing the outdoor classroom to teach Fine Communication Arts content. Contact Regina Knauer, MDC, (417) 895-6880, Melanie Carden-Jessen, MDC (417) 256-7161, Jeff Cantrell, MDC,

(417) 451-4158.
(1 hour undergraduate/graduate credit option)

March 26 & 27

Conservation Literacy
MDC Office, West Plains
9:00 am - 3:00 pm
26th - Young readers
27th - Higher level readers
Pre-reading activities that use conservation books as a springboard to content, combined with reading strategies and post-reading activities to develop Conservation Literacy.
Contact: Melanie Carden-Jessen (417) 256-7161 x 236

April 5-6

Earth Day Projects
5th - 8:00 - 9:00 pm
6th - 9:00 am - 5:00 pm
Jerry J. Presley Education Center
Utilizing Projects Learning Tree and WET, this workshop will focus on activities that can be used in conjunction with Earth Day projects/celebrations. Participants will receive 3 cross-curricular activity guides containing a total of 266 activities plus their associated correlations to the Show-Me Standards.
Contact: Jean Mayer, MDC, (417) 895-6880, x 1036

April 6

Earth Day Every Day
Walter Woods, Joplin
8:00 am - 4:30 pm
Combined Projects WILD and Learning Tree workshop with an emphasis on activities to compliment and extend Earth Day projects.
Contact: Regina Knauer, MDC, (417) 895-6880, Melanie Carden-Jessen, MDC (417) 256-7161, Jeff Cantrell, MDC, (417) 451-4158.

April 11-12

Journaling on the Prairie
MDC Office, West Plains
11th - 2:00 - 5:00 pm
12th - 8:00 am - 4:00 pm
An afternoon spent fine tuning your journaling skills followed by a day on the prairie journaling in the tradition of Shoecraft, and Lewis and Clark.
Contact: Melanie Carden-Jessen, MDC (417) 451-4158 x 236

April 11-12

Conservation Seeds
Litton Center, Chilicothe
11th - 4:30 - 7:30 pm
12th - 8:00 am - 5:00 pm
Newly revised early childhood curriculum and activity guide. This workshop will include ways to use the materials in an outdoor classroom.
Contact: Greg Collier, MDC, (660) 646-6122

April 18

Educators Open House
Discovery Center, 4750 Troost, Kaufman Legacy Park, Kansas City
1:00 - 8:00 pm
Drop in anytime and find out about programs and services available to school groups from the NEW Missouri Department of Conservation Discovery Center.
Contact: (816) 759-7300

April 19-20

Ethics & Social Sciences in the Outdoor Classroom
SMSU, Springfield
19th - 5:00 - 10:00 pm
20th - 7:00 am - 6:00 pm
Designed for pre-service or in-service educators interested in utilizing the outdoor classroom to teach Social Sciences content.
Contact Regina Knauer, MDC, (417) 895-6880, Melanie Carden- Jessen, MDC (417) 256-7161, Jeff Cantrell, MDC, (417) 451-4158.
(1 hour undergraduate/graduate credit option)

April 27

Earth Day Kansas City
Kansas City Zoo
9:00 am - 4:00 pm
A 3-mile fund raising walk to reduce local pollution and improve local habitat starts at 9:00 am. Party for the Planet begins after the walk with environmental information booths and assorted entertainment.
Contact: Stacia Stelk, (888) 895-3605

Did You Know?

Missouri is the
- second leading state in the number of farms
- one of the leading livestock producing states

Paper Facts

Environment Recycled Paper is made from Over 75% recycled paper including 25% post consumer fibre.

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SuccessLink Adds EE

Successlink's web site <www.successlink.org> is adding environmental education (EE) to its repertoire of content areas for lessons and teaching units. EE will be a subcategory under Integrated Curriculum and can be used in a keyword search or selected as a content area when submitting an activity. This web site is filled with free lessons and teaching units that are performance-based, current, and aligned to the Show-Me Standards.

The EE section will be initiated as soon as activities designated as EE are submitted and approved. Incentives to submit teaching ideas include career ladder hours, graduate credit, and $100 cash awards. Submit your successful EE activities and lessons plans today and take advantage of this excellent educator service.

For more information contact Marsha Baclesse at (888) 636-4395 or marsha@successlink.org.

Mission Statement:

The Resource is published in October, December, February and April by the Office of Environmental Education. Its purpose is to provide: current information on conservation and environmental education resources and events; suggestions for integrating environmental subjects into teaching; a forum for environmental education discussion and networking in Missouri; and a clearinghouse for bringing together environmental education resources and partners.

For a free subscription or to submit information to the newsletter, write to: Office of Environmental Education, Missouri Department of Conservation, P.O. Box 180 Jefferson City, MO 65102-0180.

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Missouri Department of Conservation
Contributors: Missouri Department of Agriculture and Missouri University
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OUTREACH & EXTENSION
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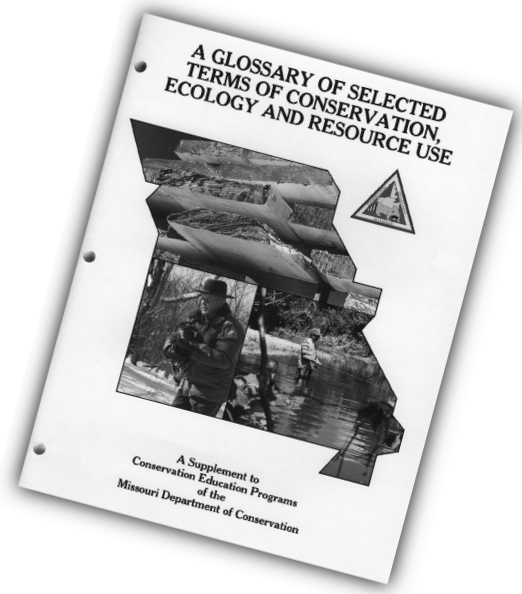
Conservation Curriculum

THIS ISSUE

This issue of the *Resource* connects agriculture and conservation. The curriculum insert provides specific lesson plans on the topic at three separate grade levels with pages ready to copy for student activity. The back page of the curriculum insert includes additional resources to supplement conservation instruction.

garage sale

The Conservation Department is having a garage sale! We are overstocked on certain items and would like to offer them to you. While we always have a wide variety of educational information available free of charge, we extend the opportunity for you to request multiple copies of the items listed below. To order, clip the form below and send to Distribution Center, Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180 or call 573-751-4115 ext 3837 or fax 573-522-2020.



___**Casting Equipment** - A 71 page instructional book covering ethics, specific subject information, lesson plans and student handouts on freshwater casting. **(E100)**

___**A Glossary of Selected Terms of Conservation, Ecology and Resource Use** A 77-page reference source to supplement the Department's expanded conservation education programs. **(E045)**

___**Missouri Game Birds Poster -** Large colorful poster of Missouri game birds with a lesson plan to help students identify the birds, their habits and habitats. **(E001)**

___**Missouri Mammals -** Large colorful poster showing Missouri mammals. **(E022)**

___**Rare & Endangered Amphibian-Reptile Poster -** Large colorful poster of Missouri's rare or endangered amphibians and reptiles **(E00024)**

___**Life in a Fencerow -** Large colorful poster of a Missouri fencerow. Accompanying lesson plan helps students identify wildlife that depend on fencerows for food and cover. Lesson tied to Missouri Show-Me Standards. **(E084)**

Name _____

School Shipping Address (UPS will not deliver to a PO Box number)

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Contributing to this issue. . .

Thanks to the individuals and Missouri Department of Agriculture who contributed to the curriculum insert.

Velynda Cameron
Director, University Child Care Center
Southwest Missouri State University
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Missouri Department of Agriculture
Show-Me Agriculture Winter 2001 issue

Conservation & Agriculture

Partners in Grime

PreK-2

Objectives:

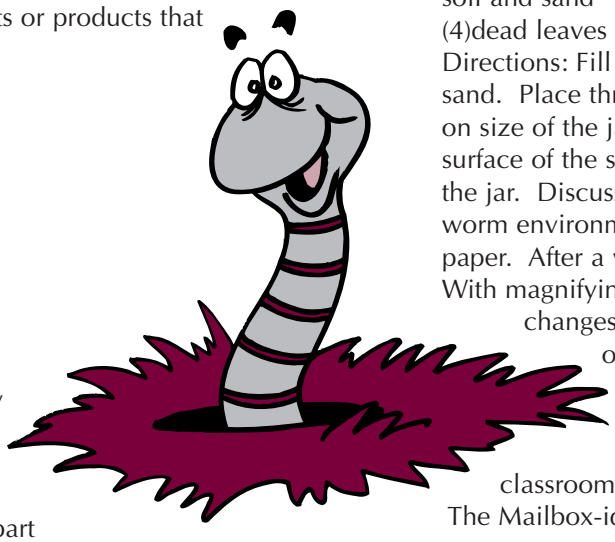
Children will understand why worms are important to agriculture and conservation. Second, they will learn that corn is a seed. Third, children will be able to identify two corn products or products that are made from corn.

Materials:

- Adjoining copy page
- Stapler
- Scissors
- Crayons

Procedure

1. Color each picture
2. On the last page draw something related to earthworms and corn
3. Cut picture squares apart
4. Staple left sides together forming a book
5. Have each child tell the story of a corn seed
6. Adults write a story line as dictated by child



earthworms

Earthworms are very important to conservation and agriculture. They improve topsoil and make it healthier for plant growth. They eat the dead organisms in the soil. They digest the parts their bodies need and excrete the rest, making soil richer in minerals which are necessary for plant growth.

Earthworms may be so tiny you need a magnifier to see them or they can grow to be several feet long. There are many different kinds of earthworms and we know them by names such as red wrigglers, night crawlers and field worms. Earthworms have no head, eyes, teeth or antennae. Their body is made up of many ring-like segments easy to see. After it rains earthworms can usually be found near the surface of the soil.

Some people raise earthworms to sell as fish bait or to help enrich poor soil. Earthworms are a friend to conservation too. They help compost fallen rotting trees and leaves, turning them into rich soil for plants and trees to use for food.

Create a worm world

Materials needed are (1) large glass jar with lid (2)damp soil and sand (3)six earthworms (4)dead leaves (5)black paper.

Directions: Fill the jar with alternate layers of damp soil and sand. Place three to six earthworms in the jar (depending on size of the jar). Add a few dead leaves to cover the surface of the soil. Punch holes in the jar lid and place on the jar. Discuss with the children the appearance of the worm environment. Cover the sides of the jar with black paper. After a week has passed, remove the black paper. With magnifying glasses have the children observe the changes in the earthworm's world. Once your study of earthworms has ended be sure to release them where they will survive. A flower bed is a good choice.

Adapted from USDA - Ag in the classroom-Worm Watching <**www.agclassroom.org**>
The Mailbox-ideas for Teachers Aug/Sept 1995 p.18-23

Seeds - Corn

Corn is Missouri's second largest crop in production and it is also our nation's top crop. Corn is used to make many different types of products, not just food for animals and people. Corn is used to produce many products found in the classroom, including paper, ink, glue, batteries, crayons, paint, play dough and even the clothes you are wearing.

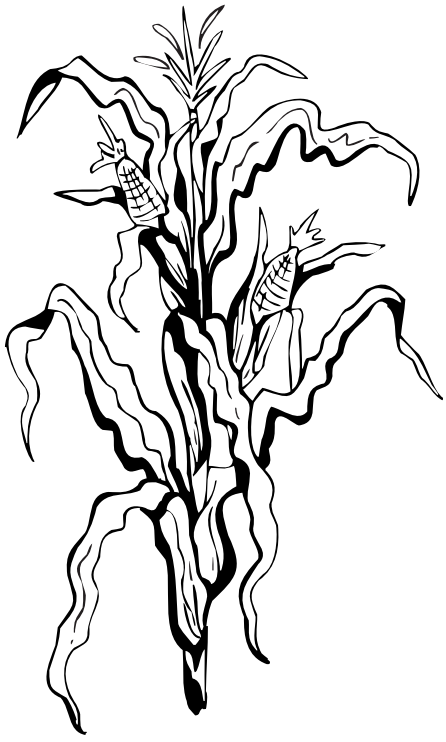
The kernel is the most important part of a corn plant. It is the SEED. It contains everything needed for a new plant to grow. There are four major types of corn:

- Sweet corn - eaten as a vegetable
- Popcorn - eaten as a snack
- Field corn - used for animal feed and other industrial purposes
- Seed corn - planted for crop production

All four types of corn grow on a corn cob. Each ear of corn can contain as many as 600-800 kernels. Kernels are the seeds of new life, storing renewable energy.

Wild animals, such as deer, turkey, squirrels and raccoons, like to eat corn too. Leaving the outside rows of a corn field uncut benefit the animals by providing not only food, but cover from predators. Corn - it's simply a-maizing.

Adapted from Missouri Corn online
<www.mocorn.org/facts.htm>
NCGA - Corn Curriculum **<www.ncga.com/education>**

THE LIFE of a CORN SEED		
		

SHOW-ME AGRICULTURE

5-8

Missouri Department of Agriculture, Winter 2001 issue

Standards:

Goal 1 - 5,6 Goal 4 - 1
Goal 3 - 5 MA 1, 4

Materials

Adjoining copy page and pencil.

Procedure

Read the articles and follow with math lesson.

Space Age Jeans

If someone asked you where your denim jeans came from, what would you say? You would probably say that they came from the store. Did you ever stop to think that your jeans could have come from a farm? Denim jeans are made from cotton. Cotton is a crop that is grown on farms in southeast and southwest Missouri. Southern states such as Texas and Arkansas grow most of our cotton.

Farmers in some parts of Missouri raise large amounts of cotton on their farms. In the spring, a cotton farmer uses a big tractor with a special planter to plant the cotton seeds. The cotton plants grow for several months and form cotton bolls (the part of the plant that contains the cotton fibers). A large cotton picker harvests cotton bolls later in the fall.

Read this story about a "space age" Missouri cotton farm:

Mr. And Mrs. Brown are cotton farmers. They live in southeast Missouri and each year they plant about 1200 acres of cotton. Their farm measures nearly two miles long and one mile wide. The Browns have two huge tractors that they use to prepare the soil and plant the cotton seeds. The Browns also use a GPS guidance system when planting, spraying, fertilizing, tiling and harvesting. GPS stands for Global Positioning System. GPS uses satellites to allow the Browns to tell exactly where they are in their fields. One of their large tractors is fitted with a light bar that receives a signal from a satellite. While driving the tractor, the farmer can watch a bar of light to make sure the tractor is staying on a straight line and is not going over an area for a second time. The light bar GPS system allows the Browns to work in dust, fog, wind, or the dark. They use the GPS to map fields so they can apply just the right amount of fertilizer to each area of the field. This is important so they don't put too much fertilizer on any part of the field. That would be a waste of their time and money. When the Browns are using the tractor, there is a computer in the tractor that receives information from the satellite. When the cotton plants are growing, the Browns can use GPS information to help decide exactly where to spray a pesticide. Pesticides are used to prevent insects from damaging the plant, but farmers don't want to use too much of them. At harvest time, the large cotton picker not only harvests the cotton, but it also keeps track of how much cotton was produced in each part of the field. The farmer can then have a map that tells which parts of each field produced lots of cotton and which areas did not produce so much. Then next year, they can spread more fertilizer on the areas that were not productive or plant a different crop in that area.

Do you think this sounds like a story from the future? Just a few years ago, we would have said that this was a "space age" farm. However, this story tells about how some Missouri farms produce cotton in the year 2001 –right now! There is no doubt that the cotton in your jeans came from a cotton farm and it is very possible that satellites far above the earth played an important part in the production of that cotton.

Sheep and Wool

Most Missouri sheep grow from six to sixteen pounds of wool every year. This wool keeps them very warm. However, sheep would get uncomfortable if they had too much wool during the summer. Therefore, once a year sheep farmers hire a person to come to their farms to take the wool off the sheep–this person is called a shearer. In early days, shearers used hand shears that were like very sharp large scissors to remove the wool. Today shearers use electric shears that quickly remove the wool. Sheep can be sheared any time but usually it is done in the spring. A good shearer must be strong because sheep can weigh more than 200 pounds. They must also be gentle as sheep have very tender skin and are easy to cut.

All of the wool that is removed from one sheep is called fleece. The amount of wool will depend on the size and breed of the sheep. After dirty parts of the wool are removed from the fleece it is packed into large plastic bags. The bags hold several hundred pounds of wool. Wool is sold to a company that will then sell to a woolen mill.

At the mill, the wool is scoured (washed) to remove oil and dirt. The wool will then be carded, which will separate the wool fibers so they can be spun into yarn. The wool yarn can be dyed and is then woven into fabric or knitted into a nice, warm sweater.

Agri-Math

A Bale of Cotton

After cotton has been harvested it is sold in a bale. A bale is a big package of cotton that weighs about 500 pounds. One bale contains enough cotton to make about 250 pairs of children's jeans. Use this information to help you answer these questions about cotton and jeans.

1. If cotton is selling for sixty cents per pound, how much does a farmer get for selling one bale of cotton?

2. How many pounds of cotton are used to make one pair of jeans?

3. How much money does the farmer get for the cotton used to make one pair of jeans? (Use questions 1 and 2 to help solve this problem.)

4. About how much does a new pair of jeans cost? (Look in your local newspaper or clothing catalog for current prices.)

5. How much more does the new pair of jeans cost than the amount that the farmer received for the actual cotton in the jeans? (Use question 3 to help solve this problem.)

6. For discussion: Since a farmer gets only a small portion of the total cost of a pair of jeans, who gets the rest of the money? (Economic term is middle man.)

Shearing calculations

1. Kevin sheared 100 sheep today. If each sheep produced 7 pounds of wool, how many pounds of wool does the farmer have to sell?

2. If a wool bag holds 200 pounds of wool, how many wool bags should the farmer buy? (Note, you cannot buy a part of a wool bag.)

3. Kevin can shear one sheep in three minutes. How many can he shear in an hour?

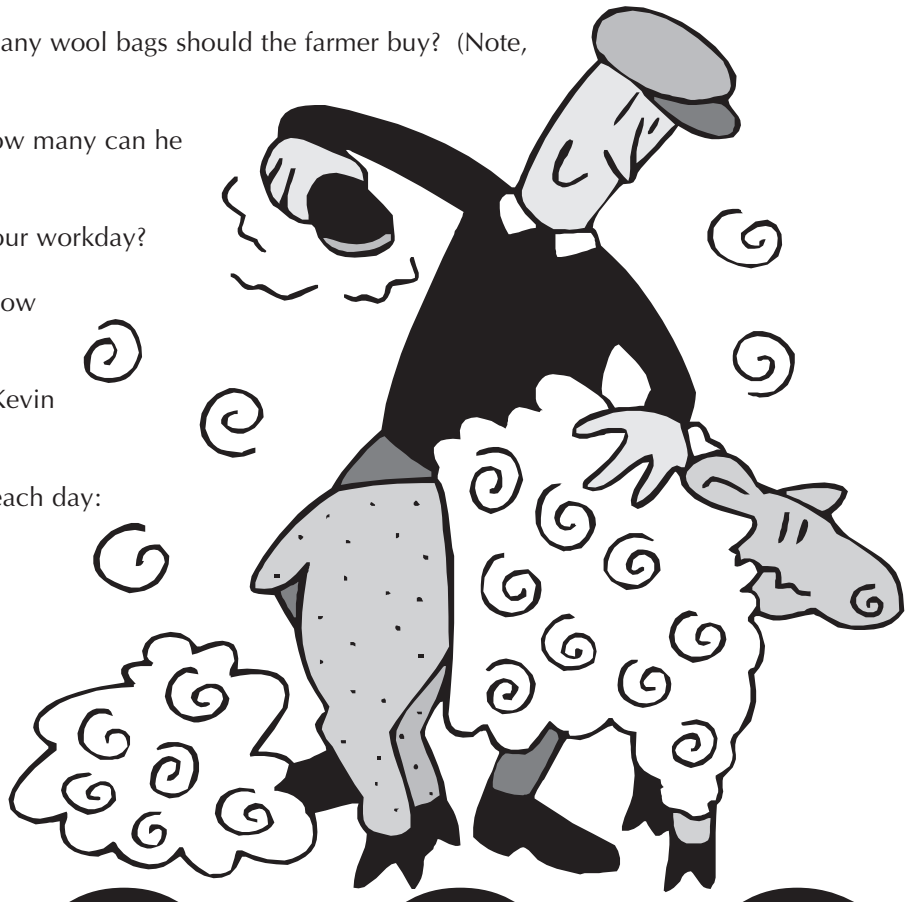
4. How many sheep can Kevin shear in an eight-hour workday?

5. If he charged $2.00 per sheep that he sheared, how much did he make per day?

6. If a farmer has 800 sheep, how many days will Kevin have to shear?

7. Here are the numbers of sheep that he sheared each day:
   Monday - 100
   Tuesday - 90
   Wednesday -110
   Thursday - 120
   Friday - 80
   How many total sheep did he shear this week?

8. What was the average number of sheep that he sheared each day?



Gardens & Green Tracts

What do they have to do with CO2?

9-12

Objectives

After completing this activity, students should be able to:

1. Draw and analyze an appropriate scientific graph for data given in table form for benefit of high levels of CO2 to plants. (Goal 1.5, 6 & 8, IA.1)
2. Identify the independent and dependent variables for data they are given. (Goals 1.1 & 3, IB.1&3)
3. Change the independent variable to develop an experimental design of their own. (Goals 1.1 & 3, IB.1&3)
4. Write a question that promotes scientific research on the topic introduced and develop a hypothesis related to this question. (Goals 1.1 &2 & Goal 3, IB 1 & 3)
5. Write a proposed procedure to test this hypothesis that is logical and includes several steps. (Goals 1.1 & 3 & Goal 3)

Background

This activity uses the same format developed by Missouri teachers for the 2002 performance section of the MAP test. It will allow students to practice skills included on the high-school level test. In addition, the hands-on portion uses inquiry techniques beneficial to student learning.

Procedure

These steps correspond to the numbered steps on the adjoining student page.

1. Have the students read the scenario and examine the table of information given regarding CO2 levels and plant leaf area for maze plants. Point out that 340 ppm is the level of CO2 that is considered to be "normal" and 680 ppm is twice that level. Have the students write a title for the table.
2. Discuss the best type of graph to represent this information. Since both the dependent and independent variables are continuous, the best type of graph is a line graph. Make sure that each student graphs the information following the standards used by the state assessment –
   - Provides an appropriate title that tells the relationship between the independent and dependent variables.
   - X axis is labeled with the independent variable and Y axis with the dependent variable
   - X and Y axis numbered correctly and consistently to **fill** the grid.
   - X and Y axis are labeled with units
   - Points for two groups of data are plotted separately on the same graph with a key given to distinguish them.
3. Instruct students to answer questions for this part of the activity. The answer to d. should include information about lab technique, limited data, repeatability, and number of trials. You may have to point out some of these limitations to students. Discuss the number of trials needed to make an investigation scientifically significant (25 trials minimum).
4. This section promotes students designing an experiment of their own. The four questions are adaptations of the "Four Question Strategy" written by Cothron, Giese, and Rezba , 1993. The answers to the four questions can be used to determine what the students know about the subject. They can also be used to lead students to identify what experiments can be done to obtain new information on their topic. The questions promote excellent class discussions, making students feel more comfortable writing an experimental design on their own.
5. An outline of requirements for the experimental procedure is provided to assist with teacher scoring.
6. The questions and exercises for the procedure are designed to complement either performing or not performing the experiment. Either way, discussion is valuable to students as they prepare for MAP.
7. The section is flexible allowing students to perform their own experiment if time allows. Students aren't required to perform experiments they develop for the MAP test but much can be learned from hands-on activities.
8. This final section focuses back to the original question. This takes the exercise full circle and promotes further discussion of the topic.

A recent environmental trip to Japan impressed a group of students with the number of plants and gardens located there. Large household gardens were observed as well as small gardens on nearly every balcony and doorstep. If space allowed, plants were there. Students learned the Japanese government takes CO_2 emission very seriously. They promote activities such as gardening and planting green tracts to reduce the amount of CO_2 and other greenhouse gases in the atmosphere. Studies are conducted regarding the influence of plant growth on the environment and vice-versa. After returning to the U.S., one student pursued her interest in gardening and CO_2 reduction and identified interesting information. The table below includes information discovered relating to CO_2 and maze (corn) growth.

Table I:

Days of Growth	Leaf Area (cm^2): 340 ppm CO_2	Leaf Area (cm^2): 680 ppm CO_2
5	28	28
10	115	120
15	363	466
20	400	885
25	598	889
30	692	965
35	781	995
40	788	1018

1. Identify the independent and dependent variables and provide a title for the table that describes their relationship.
2. Discuss with your teacher the best type of graph to use representing all of the information in the table, and then graph the information. Remember to use all of the components of an appropriate scientific graph for the data.
3. Answer the following questions based upon the graph.
   a. How does leaf area growth compare between the two situations?
   b. What pattern/s do you see represented by the data? Support your thoughts with specific information from the table.
   c. What would you predict the data to show if it had been given for 45 and 50 days of growth? Why?
   d. What possible sources of error could there have been related to the information found in this table?
4. What other types of questions does this graph raise? Write a different question that you could answer by doing an experiment of your own related to plants, plant growth, and CO_2. Remember, changing one thing in the experiment changes the experiment and makes it your own, if that experiment has not been done by someone else. Example: change the plant from corn to soybeans or change from CO_2 exposure to CO exposure.

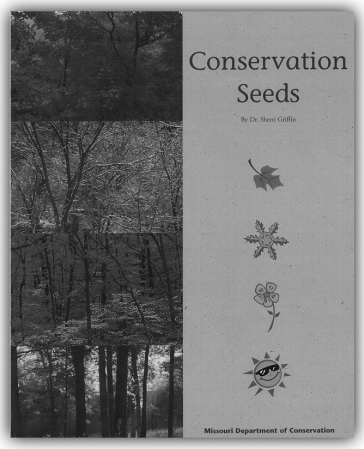
   Use the four questions below to explore various ideas for your experimental question.
   o What materials do I have available for conducting experiments on plant growth and gas levels?
   o How do plants and CO_2 (or other gases) act in relation to one another?
   o What one change can I make in the set of materials to do a different experiment than the one that was done here?
   o How will I measure the response to this change and what format will I use to record my data?
5. Now write an experimental procedure that you could use to gather data to answer the research question you developed in step number 4. This experimental procedure should include:
   o A hypothesis that describes how the change in the independent variable you chose will affect the dependent variable. Remember to use only one independent variable.
   o The independent and dependent variables and control (if there is one).
   o The things that will be held constant.
   o A list of materials needed to perform the experiment.
   o A step-wise procedure that anyone could read and follow, getting the same results as you or proving you false.
6. Answer the following questions about your experiment:
   a. What measurements would you record from your experiment? Develop a table that you could use to record the information you will gather during the experiment.
   b. What units would be most appropriate to use for these measurements?
   c. What kind of graph would you use later to represent the data you will gather?
7. With the permission of your teacher conduct the experiment that you have designed. Gather data and write a concluding report that includes whether your data supports your hypothesis. Have fun doing science.
8. Now back to the original question, "Gardens and green tracts – What do they have to do with CO_2?" Propose an answer to this question and discuss it with your classmates.

Teacher resources

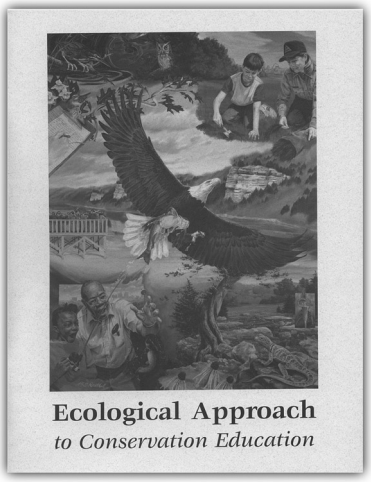
Conservation Seeds

The recently revised Department of Conservation early childhood curriculum offers the following lessons on this issue's topic of agriculture.

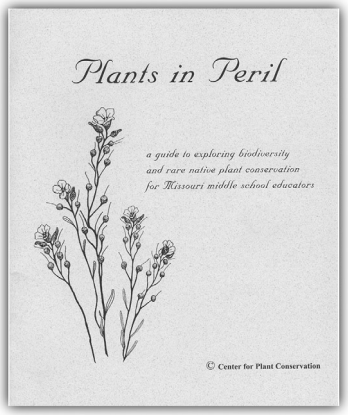
***FALL Section* - The Harvest - Lesson 15, Page 30.**
***FALL Section* - Animal Harvest - Lesson 21, Page 42.**
SPRING Section - How Does Your Garden Grow? - Lesson 23, Page 190.
SPRING Section - Seeds, Roots, Plants - Lesson 26, Page 196.
***SUMMER Section* - Harvest Time - Lesson 30, Page 286.**



Ecological Approach to Conservation Education



This instructor reference manual is designed to help teachers integrate conservation education into their curriculum. The manual provides background information and suggestions for teaching about conservation. In addition, it presents basic ecological understandings on which conservation practices should be based. The activities are designed for use with junior and senior high school students; however, elements of the narrative and activities may be adapted to all grade levels.



Plants in Peril

This guide to exploring biodiversity and rare native plant conservation is prepared for Missouri middle school educators. It explains biodiversity, reviews rare native plants and the challenges of saving them, offers four classroom activities and provides numerous educator resources.

media loan list

Creating an Urban Oasis

Junior High-Adult/ 20 min./ All formats available
Trees can make a big difference in city life. Keeping them thriving in an urban environment, though, can be a real challenge. Learn from a variety of Missourians what you can do to enhance trees in your town or city.

How Plants Get Food

Kindergarten-3/ 17 min/ VHS video
Carbon dioxide...oxygen...chlorophyll...photosynthesis. These are complex words explained in a bright, entertaining way as students learn the basics of how plants make their own food.

The Living Landscape

Upper elementary/adult 28 min/ all formats. This story portrays the American farm as a living landscape, where many life forms coexist with modern agriculture. The film shows how farming can function in harmony with the soil, plants and animals.

The books or videos listed above may be obtained by contacting Media Librarian/Distribution Center, Missouri Department of Conservation, PO Box 180, Jefferson City, MO 65102-0180 or call 573-751-4115 ext 3837 or fax 573-522-2020 or <Wolfec@mail.conservation.state.mo.us>